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(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/580,310
Filing Date: April 17, 2007
Appellant(s): COLLOMB, CEDRICK STANISLAS

Pedro C. Fernandez
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/16/2009 appealing from the Office action mailed 6/8/2009.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,704,024	Voorhies et al.	12-1997

US 2003/0112238 A1 Cerny et al. 6-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 1-9, 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Voorhies et al. Patent No.: 5,704,024 in view of Cerny et al. Pub. No.: US 2003/0112238 A1.

2. Regarding claim 1, Voorhies teaches: A method performed by a computer of forming a two dimensional map of a three dimensional environment, there being a map origin located in the three dimensional environment, a viewing direction vector defined passing through the map origin, and a one-to-one correspondence between map positions in the map and the directions of vectors passing through the map origin; the method comprising the steps of: associating by the computer an environment position in the three dimensional environment with a folded vector that passes through the map origin, the folded vector lying in a plane containing both the viewing direction vector and the environment position and forming an angle with the viewing direction vector that is a predetermined function of the angle between the viewing direction vector and a vector between the map origin and the environment position (fig. 9) (R is the folded vector because Rx and Ry components are divided by the magnitude of the sum of the reflection vector components (i.e., divided by 5.5) to determine the indexed location on face four of the environment map, also R passes through the origin and forms an angle with the viewing direction vector E); and deriving by the computer properties for a map position from the properties of the corresponding environment position (fig. 6 see also col. 12 lines 13-31).

3. Voorhies doesn’t teach: associating by the computer an environment position with the map position corresponding to the direction of the folded vector associated with that environment position.

4. The analogous prior art Cerny teaches: associating by the computer an environment position with the map position corresponding to the direction of the folded vector associated with that environment position (fig. 3 see also [0030]) for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

5. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine associating by the computer an environment position with the map position corresponding to the direction of the folded vector associated with that environment position as shown in Cerny with Voorhies for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

6. Regarding claim 2, Voorhies teaches: A method, in which the predetermined function is a multiplication by a predetermined quantity (fig. 12, 1525 see also col. 16 lines 9-20).

7. Regarding claim 3, Voorhies teaches: A method, in which the predetermined function is a multiplication by 0.5 (fig. 12, 1525 see also col. 16 lines 16-19).

8. Regarding claim 4, Voorhies teaches: A method, in which the one-to-one correspondence of a map point with the direction of a vector through the map origin represents a projection onto a predetermined plane of a point on the vector which is a predetermined distance from the map origin (fig. 6).

9. Regarding claim 5, Voorhies teaches: A method, in which the predetermined plane is a plane orthogonal to the viewing direction vector (fig. 6).

10. Regarding claim 6, Voorhies teaches: An image rendering method comprising the steps of: generating a two dimensional map of a three dimensional environment (fig. 4, 512); for a point of interest on an object to be displayed, deriving a reflection vector in dependence on a normal vector at the point of interest and a direction of view (fig. 4, 510); referencing a position in the two dimensional map using the reflection vector, to detect environmental properties at that map position (fig. 6).

11. Voorhies doesn't teach: varying the appearance of the object at the point of interest in dependence on the detected environmental properties.

12. The analogous prior art Cerny teaches: varying the appearance of the object at the point of interest in dependence on the detected environmental properties (fig. 4, 430) for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

13. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine varying the appearance of the object at the point of interest in dependence

on the detected environmental properties as shown in Cerny with Voorhies for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

14. Regarding claim 7, Voorhies doesn’t teach: A method, in which the varying step is performed in dependence on a reflectivity of the object at the point of interest.

15. The analogous prior art Cerny teaches: A method, in which the varying step is performed in dependence on a reflectivity of the object at the point of interest (fig. 4, 430) for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

16. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the varying step is performed in dependence on a reflectivity of the object at the point of interest as shown in Cerny with Voorhies for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

17. Regarding claim 8, Voorhies doesn’t teach: A method in which the environmental properties represent lighting properties.

18. The analogous prior art Cerny teaches: A method in which the environmental properties represent lighting properties (fig. 4, 415) for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

19. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the environmental properties represent lighting properties as shown in Cerny with Voorhies for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

20. Regarding claim 9, Voorhies doesn't teach: A computer-readable medium having instructions stored therein which when executed, cause a computer to perform the method.

21. The analogous prior art Cerny teaches: A computer-readable medium having instructions stored therein which when executed, cause a computer to perform the method (fig. 2, 210) for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

22. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine computer-readable medium having instructions stored therein which when executed, cause a computer to perform the method as shown in Cerny with Voorhies for the

benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

23. Regarding claim 13, Voorhies teaches: Apparatus for forming a two dimensional map of a three dimensional environment, there being a map origin located in the three dimensional environment, a viewing direction vector defined passing through the map origin, and a one-to-one correspondence between map positions in the map and the directions of vectors passing through the map origin; the apparatus comprising: means for associating an environment position in the three dimensional environment with a folded vector that passes through the map origin, the folded vector lying in a plane containing both the viewing direction vector and the environment position and forming an angle with the viewing direction vector that is a predetermined function of the angle between the viewing direction vector and a vector between the map origin and the environment position (fig. 9); and means for deriving properties for a map position from the properties of the corresponding environment position (fig. 6 see also col. 12 lines 13-31).

24. Voorhies doesn’t teach: means for associating an environment position with the map position corresponding to the direction of the folded vector associated with that environment position.

25. The analogous prior art Cerny teaches: means for associating an environment position with the map position corresponding to the direction of the folded vector associated with that environment position (fig. 3 see also [0030]) for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an

object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

26. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine means for associating an environment position with the map position corresponding to the direction of the folded vector associated with that environment position as shown in Cerny with Voorhies for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

27. Regarding claim 14, Voorhies teaches: An image rendering apparatus comprising: map generating apparatus (fig. 3, 410); means for deriving a reflection vector, in respect of a point of interest on an object to be displayed, in dependence on a normal vector at the point of interest and a direction of view (fig. 4, 510); means for referencing a position in the two dimensional map using the reflection vector, to detect environmental properties at that map position (fig. 6).

28. Voorhies doesn’t teach: means for varying the appearance of the object at the point of interest in dependence on the detected environmental properties.

29. The analogous prior art Cerny teaches: means for varying the appearance of the object at the point of interest in dependence on the detected environmental properties (fig. 4, 430) for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic

reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

30. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine means for varying the appearance of the object at the point of interest in dependence on the detected environmental properties as shown in Cerny with Voorhies for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

31. Regarding claim 15, Voorhies doesn’t teach: A video game machine comprising apparatus.

32. The analogous prior art Cerny teaches: A video game machine comprising apparatus (fig. 2, 200) for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

33. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine video game machine comprising apparatus as shown in Cerny with Voorhies for the benefit of to implement a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

(10) Response to Argument

Appellant, on page 18, argues that an "actual" three dimensional environment and an "environment map of that three dimensional environment" are two different technical concepts. It should be easily appreciated that such a "three dimensional environment map" is not the actual three- dimensional environment itself, but a specific representation of it used for the computationally efficient generation of reflections in an object that looks as if they have come from the actual three-dimensional environment. The presently claimed invention makes this distinction between a map and an environment in Claim 1, which recites “forming a two dimensional map of a three dimensional environment.”

The Examiner disagrees because Voorhies et al. teaches **forming a two dimensional map of a three dimensional environment,** (see fig. 6 and col. 11 lines 55-63) (“The six faces of a cubic environment map (which are selectively referenced by three-dimensional reflection vectors) can be stored as six two-dimensional maps in conventional two-dimensional texture mapping hardware”); thus Voorhies teaches forming a two dimensional map of a three dimensional environment because any plane (including the faces) in the cube is a **two dimensional map of a three dimensional environment**. This argument applies as well to Appellant's remaining arguments that Voorhies doesn't teach forming a two dimensional map of a three dimensional environment on pages: 19, 20, 21, 22, and 24 of the Appeal Brief.

Appellant, on page 19, argues that Claim 1 (and similarly claim 13) recites "deriving by the computer properties for a map position from the properties of the corresponding environment position." Thus feature line therefore requires:

i. an environment position;

ii. a map position corresponding to it; and

iii. deriving a property for that map position from the corresponding environment position (e.g. deriving a texture pixel color).

The Examiner cites col. 12, lines 24-31 of Voorhies, and states that reflection vectors (from the object being rendered) are used to identify a location on an environment map and retrieve the appropriate shading value from the map. Thus, the Examiner's own reading of Voorhies demonstrates a conventional retrieval of texture data from a map at the appropriate reflection point. However, it clearly does not demonstrate deriving initial data for the map (which Voorhies then retrieves), and moreover does not mention deriving such data from a corresponding position in the original environment.

The Examiner disagrees, Voorhies does teach **"deriving by the computer properties for a map position from the properties of the corresponding environment position"** (see fig. 6 and col. 12 lines 13-31) ("An example of steps 615 and 620 is shown in Fig. 6 (which presents a vector diagram of a generated reflection vector of the present invention indexing a cubic environment map which is aligned with the axis of the coordinate system). The reflection vector is represented by the coordinates 2.5, 1.0, -2.0, in this coordinate system…The values for the indexed location on the indexed face are then used in the conventional manner to retrieve the appropriate shading values from the indexed face of the map"); thus Voorhies teaches the above limitation because the coordinates of the reflection vector are used to determine the index location of environment map which is then used to retrieve the shading values; this argument applies also to Appellants remaining argument(s) regarding "deriving by the computer properties

for a map position from the properties of the corresponding environment position" on page 21 of the Appeal Brief.

Appellant, on page 20, argues Since Voorhies does not deal with the <u>generation</u> of two-dimensional environment maps, it follows that Voorhies does not teach or suggest the following related features found in Claim 1 (and similarly in claim 13):

i. a plane containing both a viewing direction vector and an environment position (i.e. the position currently under analysis) - see plane 1800 of FIG. 13 and the accompanying text of the present application for details;

ii. associating with that environment position a folded vector lying within the above plane - see FIG. 11 and the accompanying text of the present application for details;

iii. the folded vector having an angle that is a function of the angle between the viewing direction vector and a vector between the map origin and the environment position - for details, see the equation at page 15 line 25 of the description (paragraph [0087] in the published application), which halves the angle between the viewing direction vector and a vector between the map origin and the environment position within the above plane;

iv. associating the environment position with the map position corresponding to the folded vector - see FIG. 15 and page 16 lines 10 to 24 (paragraphs [0090-93]), where projection plane 1850 represents the surface of the map being generated; and

v. deriving a property for that map position (based on the folded vector) from the

corresponding environment position - see again FIG. 15 and page 16 lines 10 to 24 for details.

The Examiner disagrees because Voorhies does teach: **a plane containing both a viewing direction vector and an environment position, associating with that environment position a folded vector lying within the above plane** (see fig. 6) (The eye vector and the reflection vector form a plane containing both a viewing direction vector (eye vector) and an environment position (circle on +X face of cube indicated by coordinates 1.0, 0.4, -0.8); **the folded vector having an angle that is a function of the angle between the viewing direction vector and a vector between the map origin and the environment position** (see fig. 6) (The eye vector, normal vector, and reflection vectors contain an angle that is a function of the angle between the viewing direction vector and a vector (reflection vector) between the map origin and the environment position, also the folded vector is formed by the eye vector and the reflection vector; this argument applies as well to Appellant's remaining arguments regarding a folded vector as argued by Appellant on pages: 21, 22, and 23 of Appeal Brief) and; **associating the environment position with the map position corresponding to the folded vector** (Although Voorhies in view of Cerny was relied upon to teach this limitation, Voorhies in fig 6 also teaches because the circle on +X side of the cube face is the environment position that is associated with the map position corresponding to the folded vector formed by the eye and reflection vector indicated by coordinates 2.5, 1.0, -2.0); **deriving a property for that map position (based on the folded vector) from the corresponding environment position** (Voorhies does teach and this was previously argued by Examiner above regarding Appellant's arguments of page 19).

Appellant, on page 24, argues that with respect to Claim 3, contrary to what is alleged in the Office Action that 1320 of FIG. 11 in Voorhies is a multiplication by 0.5; it is submitted that 1320 multiples E by (N'N).

The Examiner disagrees because since 1320 in fig. 11 of Voorhies performs a shift operation, it could shift to the left (divide) and in fact multiply by 0.5.

Appellant, on pages 24-25, argues that The Examiner argues that paragraph [0030] of Cerny discloses generating an environment map. Appellant disagrees. Cerny is in fact concerned with a different type of environment mapping than Voorhies (and the present invention), being concerned with the illumination of objects by virtual light sources, rather than with the reflection of an environment by an object (see paragraph [0005]) of Cerny). As a result Cerny does not require an environment map representing the (non-existent) environment as the environment is not reflected.

The Examiner disagrees because Cerny is concerned with the reflection of an environment map by an object (see Abstract) (A system and method for performing environment mapping determines a computer-generated object’s reflective appearance, based upon position and orientation of a camera with respect to the object’s location…); thus Cerny does require an environment map because the object is located in the environment, and therefore one of ordinary skill in the art would combine Cerny with Voorhies for the benefit of implementing a system and method of environment mapping that depends upon an observer's location with respect to an object's location and orientation to generate a more realistic reflection pattern, and that is consistent with results of the direct normal projection method for particular object-observer geometries.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Maurice McDowell Jr./

Examiner, Art Unit 2628

Conferees:

/XIAO M. WU/

Supervisory Patent Examiner, Art Unit 2628

/Kee M Tung/

Supervisory Patent Examiner, Art Unit 2628